REMARKS

Figures 1 and 2 have been amended to show the designation "Prior Art" as requested by the Examiner.

Regarding the specification, a new abstract is attached as requested by the Examiner. The informalities regarding the subscripts have been corrected. Paragraphs [0013] and [0020] and Figure 2 have been amended to correct the reference to echo canceller circuit 20 and error signal 23 and far end excitation 25.

Claims 2-7, 12 and 16 have been cancelled. The following remarks are made in reference to the claims now pending in the application, claims 1, 8-11, 13-15 and 17-18.

The present invention, as claimed, relies upon a first factor - Nominal Step Size - and a second factor - Penalty Point Value - for determining the implemented step size for convergence of an adaptive filter. Convergence is performed to attempt to replicate, in amplitude and frequency, an inverse of the reflected near end echo. The present invention accomplishes this by better adaptively matching the echo canceller characteristics to the transmission path characteristics.

Transmission path characteristics (quality of the communication channel) include tone detection (claim 2) convergence (claim 3) combined loss (claim 4) power level of residual error (claim 5) near end background noise (claim 6) double talk detection (claim 7).

The echo canceller described in Zerguine uses two cost functions instead of a single cost function to update the echo canceller. The step size in Zerguine μ is set

dependent upon the values of the autocorrelation matrix R, (see eq. 11). Further, the weight error vectors, $C_N(n)$ and $C_F(n)$, are separate factors from the measurement noise power $E[w^2(n)]$. In eq. 18, σ^2_x is the finite variance of the Gaussian random sequence, see Assumption 2, not the far-end power.

Therefore, in equation (1) of page 6 of the Office Action, the step size would only be related to the number of taps of the filter, the finite variance and the measurement noise. Further, in order to derive Examiner's eq. (1), the examiner inserted a factor μ_{fixed} without suggestion nor support for such a factor in the Zerguine reference. Zerguine simply does not teach nor suggest any initializing values (nominal step size or penalty points) nor does Zerguine teach any adjustment to penalty points or nominal step size based upon any of the "communication channel quality" factors taught in the present invention. Zerguine only teaches a combination of least mean square and least mean fourth algorithms on the near end and far end filters to obtain better convergence.

Neither of the secondary references, Sievers 5,742,346 or Sih 5,687,229 teach the missing step size modifiers. Sievers "relates to video image compression" and is non analogous art. The pre-filtering of Sievers has nothing to do with echo or attenuation. Sievers does not address a situation of hybrids in a two wire/four wire circuit. Further, the logarithmic techniques of Sievers are ineffective at teaching the present invention, which is not about simplification of mathematics. The present invention teaches the implementation of step size modification based upon the detection of certain communication path quality states.

Sih teaches controlling echo cancellation, however, the state machine of Sih is only dependant on the presence of near end speech and/or far end speech (abstract). The step size adjustment of Sih, as illustrated in Figure 8 and discussed in Column 15, only increments the step size μ based upon values of ERLE (double talk ie. near end speech combined with far end speech) compared to the filter variable threshold. When double talk is detected, the step size is frozen so that the convergence filter setting are not lost by trying to eliminate near end speech as if it were far end echo. The present invention takes a different approach, allowing for double talk without stopping filer convergence by adjusting the penalty point value to decrease the step size when double talk is detected, claim 7.

Sih does not recognize any of the other conditions for step size adjustment taught and claimed in the present invention.

Sih II 5,592,548, column 5, only recognizes that tones occur and that tones can cause false convergence. Sih II does not propose the solution taught and claimed in the present invention.

Because the unique combination of factors claimed in the present invention is not recognized in the prior art and because Sievers is non-analogous and Sih I and II teach different approaches to echo minimization and Zerguine does not provide a formula with the factors used by the present invention, applicant assets that the claims, as amended herein contain allowable subject matter.

In view of the above amendments and comments, the Examiner is respectfully

formula with the factors used by the present invention, applicant assets that the claims, as amended herein contain allowable subject matter.

In view of the above amendments and comments, the Examiner is respectfully requested to pass the above application to issue at the earliest possible time. Should the Examiner find the application to be other than in condition for allowance, the Examiner may contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any fees associated with this communication to Deposit Account No. 20-0668.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on September 9, 2004.

Joseph J. Zito 9-9-04
Date